Tracking Analyst for Dummies

A complete Tutorial reviewing Pathfinder Office, Trimble GeoExplorer II, and ArcView.

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Introduction

Assignment:
Compile a “how-to” tutorial document, including screen captures and complete instructions, illustrating the use of the Trimble GeoExplorer II GPS unit and associated software for field capture and mapping of waypoint features. The resulting tutorial document can be used by GPS novices to complete the following basic data capture and mapping tasks:

Tasks (Learning Objectives):
1. Build and download a data dictionary to record pre-determined waypoint feature and attribute data.
2. Collect automated tracking field data with a Trimble GeoExplorer II GPS unit.
3. Transfer all field data, including waypoint features and attributes, from the GPS unit to a personal computer (PC) for differential correction and mapping.
4. Create a corresponding log file for graphical “real-time” display in ArcView GIS Tracking Analyst.
5. Produce finished display maps of project results.

About the tutorial:
The following tutorial is presented in seven sections, with each section building upon the previous one. Nevertheless, sections are written to be “stand-alone” chapters so that users needing assistance in specific topics can find answers with minimal effort. The first section describes a real-life “project” that the student has been “assigned.” The project scenario is intended to focus attention on the applied rather than the theoretical aspects of GPS mapping. The five subsequent sections present the step-by-step application of a commonly-used software package (Pathfinder Office V2.11) to first set up and communicate with the Trimble GeoExplorer II GPS unit and then manage the downloaded data. The final section of the tutorial shows the student how to produce finished maps and displays that meet the expectations of the original “project.”
Section 1 – Tutorial Scenario

As the captain of Team A project surveying team for a local engineering firm you have been assigned a project that will allow you to use your new Trimble GeoExplorer II GPS unit. The assignment is from the Blacksburg Planning Commission. The Blacksburg Planning Commission and the Blacksburg Fire Department have had many meetings since a recent fire in the Terrace View Apartment Complex. They have tried to review the plans for the area, but those old paper plans have been lost, damaged, are generally unreadable, and not up to date. The Blacksburg Planning Commission has contacted your firm to do a review of all areas inside the North Main St.-Prices Fork Rd.-Tom’s Creek Rd.-Patrick Henry Dr. loop. Your boss has assigned your team (Team A) to locate all fire hydrants around the outside of the main Terrace View development. They would also like you to report on the condition of each hydrant. Due to the town’s great desire to install these fire hydrants as soon as possible; many teams have been assigned to this project. Other teams in the surveying division will address the other areas inside the main loop.

Upon hearing that you had been contracted to locate all fire hydrants in the Terrace View loop, the Blacksburg Fire Department contacted you see if you could mark all stop signs, bus stops, and stoplights in that loop as well. They are interested in seeing where they might get held up if they are responding to a call.

When word of this leaked out, the Blacksburg Transit officials called your supervisor to ask for a report on the conditions of each of their signs in that area.

A bit confused of what you had to track you got in touch with your supervisor to find out what exactly was needed in the area. He reported:

- For the Blacksburg Planning Commission
  - Location of all fire hydrants
  - Condition of all Stop signs

- For the Blacksburg Fire Department
  - Condition of all fire hydrants
  - Location of all BT signs
  - Location of all stop signs
  - Location of all stop lights

- For the Blacksburg Transit
  - The condition of all BT signs

You are to go around the loop twice, once in each direction of traffic. You will create an inner loop and outer loop. The information you collect in this double loop will be compared with other teams working on adjacent sectors to compare for accuracy.
Section 2 – Getting Started with Pathfinder Office

Overview:
The following steps will guide you through the process of opening the Pathfinder Office software, setting up a project, creating a data dictionary for data input, and finally communicating with the GPS receiving unit to download the data dictionary that you create.

Note: The Pathfinder Office software Version 2.11 used in this tutorial is a product of Trimble Navigation Ltd. The Pathfinder Office software is fully compatible with the Trimble GeoExplorer II GPS unit. If you encounter unexplained difficulties with this tutorial, enter the help pull-down menu at the top of the screen. A variety of well-referenced help topics options are available to assist you.

Step 1 – Starting Pathfinder Office. From the Start menu in your operating system, open up the Pathfinder Office program. The Pathfinder Office screen appears, along with the Select Project screen. In the Project Name box, type in or select the name of your project. When you are finished, hit OK.
Helpful hint: In the bottom half of the Select Project box note that several project folder locations have been set up. These project folders are necessary and will be used later in the program. You have the opportunity to change the location of your project folders here. To change location of project folders, press the Modify button, which will allow you to browse to the destination of your choice.

Step 2 – Set the Local Time Zone. If you are opening a new project, you will be prompted for the local time zone. If not, select Options / Time Zone and create a new time zone. Fill in the following dialog boxes with the appropriate time zone and time difference. If you are in the Eastern Standard Time Zone, you are located 5 hours behind Greenwich, so you will put –5h. When finished, hit OK.

Step 3 – Select a coordinate system. Most types of data will display in any coordinate system that can be used in the locality. Your choice at this point will affect the display of the field data, but not the data itself. If georeferenced raster files or images are to be used with the data, coordinate systems will need to match in order to display properly. Select Options / Coordinate Systems to obtain the following dialog box. When finished entering coordinate system, hit OK.

Helpful hint: If you choose not to select the coordinate system at this point, you can alter the export file later in the program for display in AutoCad or ArcView.
Step 4 – Setting up a data dictionary. Now that you have set up the program and project files, you are ready to configure your GPS receiving unit for data capture. You will create a data dictionary in the Pathfinder Office software program that will remind you in the field exactly what to record as well as the format of each record. You will create the data dictionary prior to going into the field. Recall that the project you have been assigned requires you to collect location and attribute information for all stop signs, bus stop signs, and fire hydrants.

To begin building your data dictionary, select Utilities / Data dictionary Editor. You can also use the Data Dictionary Editor button located on the left pull-down menu. The following menu will appear (the fields will be blank, however, until you fill them in).

Using the New Feature command, type in the name of the features you want to create. In your case, you will create two new features; one called “sign” and one called “fire hydrants.” When you create a new feature, you will classify it either as a point, line, or area. In this project, all features are points. When you have filled out the New Feature dialog box, shown on the next page, click OK. [ NOTE: Remember to save your project file regularly to avoid losing large portions of work. ]
Once you have created a new feature and classified it, you are ready to add attributes to the feature. The type of attribute you select sets the format for field data entry. With the “Sign” feature selected, choose New Attribute. The New Attribute Type dialog box will appear. Select “Menu” as an attribute type and click OK. This will bring up the New Menu Attribute dialog box below. You will add three data input categories to the “Sign” feature, making “Bus Stop” the default value (because there are likely more bus stops in this project than stop signs). When you have finished adding all three attributes, click OK.
During data collection, the GPS menu screen will now prompt you for the type of sign. Once the type of sign is selected in the field, you should collect at least two more attributes; “Condition” and “Date Visited.” To add another attribute to your data dictionary, highlight the Sign feature and click the New Attribute button. You will create the Condition attribute first, with categories of Good, Poor, and Replace. Most signs are expected to be in good condition, so that will be your default value. As before, after opening the new attribute dialog box, select the Menu radio button and click OK. Under the New Menu Attribute, fill in the following information, making sure to select the Default radio button when creating the “Good” attribute value:

![New Menu Attribute](image)

When all three attribute values are entered as shown above, select OK. Now you have one more attribute to create, which is the “Date Visited” attribute. This attribute will be set up a little differently in that it will be auto-generated at each sign (in order to assure accurate date reporting, for future reference). You will set up this attribute so that no field input is required. As before, go back to your data dictionary editor and make sure the “Sign” feature is highlighted. Select “New Attribute” and when the New Attribute Type dialog box comes up, select the “Date” radio button and hit OK.

![New Date Attribute](image)

The New Date Attribute box should be filled in as shown at right. Be sure you check the Auto Generate box and the Not Permitted radio button under the Field Entry type. You may select any date format you like, unless it is project specified.
RECAP: Let’s look at what you’ve accomplished so far. Your new data dictionary is now set up so that it will prompt the field crew for the type of sign and the condition of the sign. Using the Auto Generate function of your data dictionary, the GPS unit will also automatically record the date each new feature is entered. Auto generation of dates at each record may seem redundant now, but consider how easily undated data can become worthless (often within the span of a few months).

You have one final feature to create, Fire Hydrants. Lucky for you, you will be able copy the Sign feature you just created and edit a few of its properties. Under the Data Dictionary Editor dialog box, highlight the Sign feature. Right click your mouse and hit “Copy.” Move you mouse down slightly, right click, and hit “Paste.” You have created a duplicate copy of your first feature. Next, click the Edit Feature button. When the Edit Feature dialog box appears, type the name Fire Hydrants as your new feature name (the comment line below the feature name is optional). Point classification is already selected, therefore all that is needed here is to click OK.

Highlight your new Fire Hydrants feature and note that the attributes list is identical to the attributes of the Sign feature. You will not need to distinguish different types of fire hydrants in this project. Highlight the “Type” attribute under the Fire Hydrants feature and select the Delete Attribute at the bottom of the screen.

Your are ready to save your data dictionary in the project location created when you opened the project. Pathfinder Office automatically saves your data dictionary to the correct project folder and appends the .ddf extension to your file. You can get a printout of your data dictionary by hitting the print key at the top of the Data Dictionary Editor dialog box.

Step 5 – Downloading data dictionary to the GPS receiver. Now that you have created the data dictionary, you need to transfer the *.ddf file to the GPS field unit. Before you transfer the data dictionary, you will need to do the following things to your Trimble GeoExplorer II GPS unit:

1. Delete all rover files in the Trimble GeoExplorer II GPS unit.
2. Plug the small circular end of the data download cable into the back of the Trimble GeoExplorer II GPS unit and the other end into the communication port of the PC.
3. Select Data Transfer on the Trimble GeoExplorer II GPS unit Main menu. The GPS unit is ready to receive files.

Use the following steps to transfer data from your PC to the Trimble GeoExplorer II GPS unit. Under the Utilities menu, select Data Transfer. Alternately, choose the Data Transfer button in the left menu bar.

The message at right appears as the Pathfinder Office software connects. Once the data connection is established, the Data Transfer screen appears.

In the above screen, first select Data Dictionary in the Data Type field. By default, data dictionary files are sent from the same directory from which the last data dictionary file was sent. To change the destination directory, click Source Directory. When you have given the program the correct directory, your data dictionary file immediately comes up as an available file. Select the data dictionary file to be transferred by highlighting the file name above and clicking “Add” under Selected Files. Click Transfer and your selected file will be transferred to the Trimble GeoExplorer II GPS unit. [Note: You can only send one data dictionary to a Trimble GeoExplorer II GPS unit. Existing data dictionaries will be overwritten.]

Trouble-shooting hint: If the PC can not seem to make a proper connection, or a connection error occurs, check the communication set-up on the Trimble GeoExplorer II GPS unit. On the Trimble GeoExplorer II GPS unit menu, go to Configuration/Communication/Port A. From this screen check or edit to obtain the following settings:
<table>
<thead>
<tr>
<th>Protocol</th>
<th>XMODEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>9600</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
</tr>
<tr>
<td>Data bits</td>
<td>8</td>
</tr>
<tr>
<td>Stop bits</td>
<td>1</td>
</tr>
</tbody>
</table>

Once you transfer the data dictionary, you can review it on the GPS receiver. The following section, Collecting Field Data, will cover this topic.
Section 3 – Collecting Field Data

Before heading out to collect the data you need, your supervisor pulls you aside for a brief chat. The conversation goes something like this:

Supervisor: “How is the project coming for the Blacksburg Planning Commission?”
You: “Great! We have already created our data dictionary and are just getting ready to go out into the field and collect our data.”
Supervisor: “Good. Don’t think that your hard work isn’t being noticed around here. A good job on this project will go a long way for you.”
You: “Thank you.”
Supervisor: “Now the company has spent a lot of money on these Trimble GeoExplorer II GPS units, so be careful with them out in the field.”
You: “Of course.”
Supervisor: “If you could do me a favor, try to use two different modes of transportation so that when displayed in tracking mode we will be able to demonstrate a difference in travel time. The Board of Directors would like to see additional uses for these units, and I think this would be a great way to do it. I think you are very capable of figuring out how to make that work, are you up to it?”
You: “Sure thing, you got it!”
You read up on the tracking features and make a game plan for your team. You decide that your team could use one form of transportation for one loop and another for the other loop. You decide to do the inner loop first at a normal walking speed. You only stop to gather waypoint data. The outer loop will be done by car at approximately 10-15 mph.

Overview: This section will allow you to use your Trimble GeoExplorer II GPS unit to collect waypoints and use the data dictionary. It goes through a step by step process that allows you to collect the data you have specified in your data dictionary.

Step 1 – Powering Up. Turn unit on using Power Key

Step 2 --Establishing Link. Use arrow keys to scroll to Position

Step 3 – Gaining Current Position. Allow unit to establish contact with the satellites and get a new position (2-6 minutes)

Step 4 – Preparing To Collect Data. Once you have established a link with at least four satellites, hit the ESC button

Step 5 – Capturing Data. Use arrow keys to scroll to Data Capture and press Enter

Step 6 --Opening File. Choose Open Rover File

Step 7 – Moving to Waypoints. At this point you are collecting data from the satellites. It is time to start your traverse and collect your waypoints.

Step 8 – Collecting Waypoint Information. When you reach a waypoint, choose Select Feature from the Data Capture submenu. Use the arrow keys to scroll and choose the correct waypoint and answer all questions associated with each waypoint.
Step 9 – Checking Position. You may want to return to the Main menu and go to Position to track yourself as you move. Whether or not you do that, upon reaching your next waypoint you will return to step 8 to record the new point.

Step 10 – Closing File. When you have finished go into Data Capture and choose Close File. Use arrow keys to scroll and answer Yes when asked to close file.

[Note: In Data Capture there is an option that allows you to pause from taking readings. This command is called Pause. If a problem arises or you need to stop or pause at any time, choose this command. When you are ready to start back up again, select the Resume command.]

Step 11—Powering Down. Hold down Power Key for 5 seconds to turn off.
Section 4 – Transferring Field Data to PC

Overview:
The following steps will guide you through the process of transferring field data from the GPS receiver to your PC via the Pathfinder Office software. When you are downloading your data, it is placed (by default) in the current project folder. Backup copies are placed in the backup folder. Consequently, initial project set-up is important in order to quickly locate files that have been transferred. At the beginning of this section, you will be referred back to Section 2 for a refresher course in project set-up.

Note: The Pathfinder Office software Version 2.11 used in this tutorial is a product of Trimble Navigation Ltd. The Pathfinder Office software is fully compatible with the Trimble GeoExplorer II GPS unit that is used in this tutorial. As always, if you encounter unexplained difficulties with this tutorial, enter the help pull-down menu at the top of the screen. A variety of well-referenced help topics options are available to assist you.

Step 1 – Starting Pathfinder. If you are unfamiliar or forget how to start up the Pathfinder Office Version 2.11 software, please review Section 2, Step 1 of this tutorial.

Step 2 – Making the data connection. Now you have captured the field data required for the project. You need to transfer the data file(s) from the Trimble GeoExplorer II GPS unit to your PC. Before you transfer the file(s), however, you will need to prepare a few things on your Trimble GeoExplorer II GPS unit:

1. Plug the small circular end of the data download cable into the back of the Trimble GeoExplorer II GPS unit and the other end into the communication port of the PC.
2. Select Data Transfer on the Trimble GeoExplorer II GPS unit Main menu. The GPS unit is ready to send files.

Use the following steps to transfer data from the Trimble GeoExplorer II GPS unit to your PC. Under the Utilities menu, select Data Transfer. Alternately, choose the Data Transfer button in the left menu bar.

The message at right appears as the Pathfinder Office software connects. As soon as the data connection is established, the Data Transfer screen appears.
Step 3 – Transferring data. In the above screen, first select Data in the Data type field. Next, select Receive in the Direction field. This button transfers data from the Trimble GeoExplorer II GPS unit to the office computer. By default, data dictionary files are sent from the same directory from which the last data dictionary file was sent. To change the destination directory, click Source Directory.

Next, select one or more files to be transferred by selecting file names in the Available Files field. Click Add to add them to the Selected Files field in the bottom half of the screen. Click transfer and all files that you selected are transferred. That’s it! You can check to see if the transfer was successful if the Selected Files field is now cleared. In addition, the Created column of Available Files field displays which files were transferred. When you are finished, close the Data Transfer dialog box.

Step 4 – Viewing the data. You now have the raw data files safely on your project folder. Congratulations! You will be correcting these raw data files in the next session to produce the most accurate mapping display.

Note: Two icons are used by Pathfinder Office to symbolize corrected and uncorrected files. The blue “Bull’s Eye” (top) is a corrected file, while the green and blue “Globe” (bottom) is an uncorrected file. In the dialog box below, all raw data files are uncorrected.
1. Right now, you are curious to display your feature and attribute data, even though the data is uncorrected. To do this, go to File / Open and browse to the location of your downloaded data files. Highlight the uncorrected file or files (you can display more than one file at a time) you want to view and click Open.

![Screenshot of Open dialog box showing file selection]

2. Go to the pull-down menu View and select Map if there is no check mark. This will turn on the map view.

![Screenshot of View pull-down menu showing Map option]

At last you get to see what your data looks like on a display! Even though it is not corrected (you will do that in the next session), you can make out the general scope of your project. Preliminary viewing of raw data is also a good opportunity to visually check to see if there is any obvious mismatch of data or coordinates or even missing data sets or files. Now that you are satisfied you have downloaded all the necessary data files, you can turn your attention to differential correction of the raw data.
Step 5 – Experimenting with Pathfinder Office. You now have the map displayed. You may select different features to learn more information. If you wish to see the condition of a sign, then click on the sign and view the Feature Properties or Position Properties.
Section 5 – Differential Correction of Data

Overview:
The following steps will guide you through the process of differentially correcting the field data which was transferred to the PC in section 4. When you are downloading your data, it is placed (by default) in the current project folder. Backup copies are placed in the backup folder. Consequently, initial project set-up is important in order to quickly locate files that have been transferred. At the beginning of this section, you will be referred back to Section 2 for a refresher course in project set-up.

Note: The Pathfinder Office software Version 2.11 used in this tutorial is a product of Trimble Navigation Ltd. The Pathfinder Office software is fully compatible with the Trimble GeoExplorer II GPS unit that is used in this tutorial. As always, if you encounter unexplained difficulties with this tutorial, enter the help pull-down menu at the top of the screen. A variety of well-referenced help topics options are available to assist you.

Step 1 – Starting Pathfinder. If you are unfamiliar or forget how to start up the Pathfinder Office Version 2.11 software, please review Section 2, Step 1 of this tutorial.

Step 2 – Opening the Differential Correction dialog box. Now you will select the data file(s) that was transferred from the Trimble GeoExplorer II GPS unit in Section 4.
1. Select Utilities from the pull-down menu at the top of the screen.
2. Select Differential Correction…
3. Click on Browse and select the rover file or files that were transferred to the PC in Section 4. You may select more than one file by using the Shift or Ctrl key in conjunction with the mouse.
Step 3 – Selecting the base files. Now you will download the base files from the internet. You may have Pathfinder Office locate and download the files automatically or you may go to a site and download the files manually.

1. Use your web browsers and enter http://www.runet.edu:8800/~geoserve/trimble.html. This is for data that is collected in southwest Virginia. You may need to search for sites that are close to your region.

File naming convention: There is one error correction file generated each hour. The file naming convention is as follows: site letter - last digit of year - month - day - hour in UTC time (also known as "Zulu Time" or "Greenwich Mean Time"). The .SSF file extension indicates that this file is in Trimble format.

Example: B9093010.SSF B9093010.SSF Radford assigned letter

B9093010.SSF means 1999

B9093010.SSF means the month (September)
B9093010.SSF means the day (30th day of the month)
B9093010.SSF means the hour file written (UTC time)

Source: http://www.runet.edu:8800/~geoserve/trimble.html
2. Download the appropriate files. You may need more than one file because the files are for each whole hour. If your data is one hour, but spans the change of an hour then you will need at least two files.

3. Save the files to the base directory under your project.

Step 4 – Correcting the Data File in Pathfinder Office. Click Ok and the corrected files will be generated.

Step 5 – Viewing the data. You now have the corrected data files safely on your project folder. Congratulations! You will produce an accurate mapping display.

Note: Two icons are used by Pathfinder Office to symbolize corrected and uncorrected files. The blue “Bull’s Eye” (top) is a corrected file (cor), while the green and blue “Globe” (bottom) is an uncorrected file (ssf). In the dialog box below, all raw data files are uncorrected.

1. You are curious to display your corrected data. To do this, go to File / Open and browse to the location of your downloaded data files. Highlight the corrected file or files you want to view and click Open.
2. Make sure that the Map option is on. Go to the pull-down menu View and select Map if there is no check.

3. Now that you have corrected your data you can focus on the precision and location of your points. You can view different information about a point by going to the Position Properties dialog box.
Section 6 – Exporting Data

Overview:
The following steps will guide you through exporting a data file for use in other programs. At the beginning of this section, you will be referred back to Section 2 for a refresher course in project set-up.

Note: The Pathfinder Office software Version 2.11 used in this tutorial is a product of Trimble Navigation Ltd. The Pathfinder Office software is fully compatible with the Trimble GeoExplorer II GPS unit that is used in this tutorial. As always, if you encounter unexplained difficulties with this tutorial, enter the help pull-down menu at the top of the screen. A variety of well-referenced help topics options are available to assist you.

Step 1 – Starting Pathfinder. If you are unfamiliar or forget how to start up the Pathfinder Office Version 2.11 software, please review Section 2, Step 1 of this tutorial.

Step 2 – Opening the Export dialog box. Now you will select the data file(s) that you wish to export as a different file format.
   1. Select Utilities from the pull-down menu at the top of the screen.
   2. Select Export…
   3. Click on Browse and select the rover file or files that were transferred to the PC in Section 4. You may select more than one file by using the Shift or Ctrl key in conjunction with the mouse.
Step 3 – Selecting the files. Now you will select the file that you wish to export. You will repeat this process three times. You will export a shapefile, a dxf, and a dbf.

1. Click on browse and choose the file you wish to export.

2. Select Change Setup Options. This allows you to select the output format, coordinate system, units, and other options.
3. Select ArcView Shapefile and then choose the Type of Data to Export. You will place a check in the Include Not In Feature Positions. This will include the tracking points that were automatically collected in the field.

4. Select the coordinate system. For southwest Virginia, you may wish to use UTM, zone 17 North, NAD27.

5. Select OK. This will return you to the export dialog box. Again, select OK to export the data.
6. Select the Attributes tab. Check the Date Recorded and Time Recorded. This will be useful for Tracking Analyst. Click OK.

7. The export function will generate the above dialog box that provides a summary of the operation. Click Close. This will allow the data to be imported to ArcView for use with Tracking Analyst.

8. Repeat this process for the dxf format. This will allow the data to be imported to AutoCAD.
Section 7 – Presenting the Data

Overview:
The following steps will guide you through the process of presenting your data in ArcView and AutoCAD. Please refer back to Section 6 for information on exporting data for use in other programs.

Section 7.1 – Introduction
The following steps will guide you through the process of download a raster image for background effect.

Step 1 – Download the DRG. Now you will download the DRG (digital raster graphic) from the internet. This will provide the background for both ArcView and AutoCAD.

1. For Virginia, you may use the following site:
   http://www.lib.vt.edu/subjects/maps/topolisting.html

   Online Topographic Maps Listing

<table>
<thead>
<tr>
<th>ABCDEFGHIJKLMNOPQRSTUVWXYZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Meadows</td>
</tr>
<tr>
<td>Big Stone Gap</td>
</tr>
<tr>
<td>Blacksburg</td>
</tr>
<tr>
<td>Blackstone East</td>
</tr>
</tbody>
</table>

   Go Back

2. Select Blacksburg (or the topographic map for your area).
3. Save this file to a folder and unzip the files.
Section 7.2 – Working with ArcView

Overview:
The following steps will guide you through the process of working with ArcView to display the feature and attribute collected. During the process, you will also learn how to use an amazing feature of ArcView which displays the field traverse in the order it was walked, point by point.

Step 1 – Starting ArcView 3.2a. If you are unfamiliar with ArcView, look for the icon shown at right on your computer desktop, or go to your Start menu and browse to ESRI / ArcView / ArcView3.2. When ArcView opens up, you will see the screen, below. You want to create a new project, so accept the default by clicking OK.
The following screen will appear. Since you are not ready to add data files yet, click No.

In the next step, you set up ArcView to display your data.

Step 2 – Setting up ArcView. Go to File / Extensions to bring up the Extensions screen. Check both the Sample Browser and Tracking Analyst extensions, as shown at right. These ArcView extensions will allow you to view your project data as well as display a moving “point-by-point” scene (called a Geo-event) of your traverse. When you have selected these two extensions, click OK.

[Notice on the top of your screen that a new pull-down menu, called Tracking, has been added to your menu selection.]

Click anywhere on the project window’s bar to make it active. It should be labeled “Untitled.” You want to give your project a name. Go to File / Save Project As. Browse to the directory and folder where you want to save your project files. [Note: It is a good idea to save both project and related data files in the same folder for portability.]

After you have selected a location to place your project, type in the filename terrace_view. ArcView will append the .apr extension. Click OK.
Next, open up a browser outside of ArcView and go to the ArcView folder called ext. Open the ext folder and copy the file called seesmple.avx from the ext folder to the EXT32 folder, as shown below. This file is an Avenue script (the programming language of ArcView) that will convert your point file into a tracking file.

Once you have copied the seesmple.avx file, close your browser and return to ArcView. Make the project window active, go to File / Browse Sample Extensions to bring up the Extensions dialog box. Scroll down and place a check by Point to Tracking Shapefile Wizard, as shown to the right. When finished, click OK. With this step you have completed the ArcView setup.
Step 3 – Displaying project data. Your next step is to add your project data to the view. Make the view active and press the Add Theme button, shown at right.

The Add Theme dialog box, shown at right, will appear. Browse to the location of your exported files from the Pathfinder Office program. Refer back to Section 6 – Exporting Data if you have forgotten where you placed the data. In the Add Theme dialog box, select all three of the files, as shown above. These represent the fire hydrant, sign, and point data that you collected. Click OK to add the data as three ArcView themes.

When the themes are first added into ArcView, nothing will appear. You must click on each of the three theme (.shp files) to display them, as shown below (your colors may be different from those shown). Now you have a display of your data. Of course, you will want to do some formatting to more clearly show fire hydrant and sign locations.
Step 4 – Editing the display data

Next, you want to place better symbology on your map. First, turn off the posnpn.shp file by clicking on it. What you see now are the signs and fire hydrants captured by your traverse. Double-click on the point representing fire hydrants in the legend on the left side of the screen. This will bring up the Legend Editor, shown at right.

Double-click on the hydrant point symbol once again, you will see the following screen which allows you to change point size, symbol, color, among others. Scroll down in the Marker Palette menu until you find the fire hydrant symbol. Click Apply to accept the changes and close out the Legend Editor. Your display now shows all fire hydrants with symbology and all signs as filled circles.

Next, double-click on the point symbol for the posnpn.shp file in the legend. Double-click on the symbol once again to bring up the legend editor. Change the point size from 8 to 3 and hit Apply. Close the Legend Editor and make the posnpn.shp theme active by clicking on it. Your screen should now look like that shown below.
Step 5 – Tracking analyst functions. This section will give you a brief overview of the tracking functionality of ArcView. You have already loaded the Tracking Analyst extension, but in order to show geo-tracking of your data, you need to manipulate the tables associated with the point file. Click in the legend area of the posnpnt.shp file to make it active (the theme name becomes raised when it is activated). Go to Theme / Table to display the data table of all captured points, along with time and date. Alternately, you can hit the table button on the top of the screen. The table that appears has three columns. You will add a fourth column called Date-Time. To do this, you will complete the following steps:

1. With the Attributes of Posnpnt.shp table activated, go to Table / Start Editing. Then to Edit / Add Field. Fill out the Field Definition dialog box as shown below.

   ![Field Definition Dialog Box](image1)

2. Next, go to Field / Calculate to bring up the field calculator dialog box. Fill in the formula as shown below by double-selecting equation contents from the available lists. You will have to type in the entry for “MM/dd/yyyy” making sure that you follow case sensitive form. Hit OK to calculate the new column values, which will be read by Tracking Analyst after completing the following step.

   ![Field Calculator Dialog Box](image2)
3. Under Tracking, select Convert Point to Tracking Theme to bring up the following five screens that will allow the geo-tracker to read the attribute table you built in step 2 above. Complete each of the five screens as shown to the right. Hit Next to accept each screen.

4. After completing all five screens, New Theme dialog box, below, will be displayed. Select a name and location for the new theme. Hit OK to add the new theme to the ArcView drawing view.

5. The new drawing looks like this.
Notice that a new set of points has been added with the new theme, as well as connecting lines representing the track. In the next step you will turn on the tracking function and make the picture move!

6. Under Tracking, select Playback Manager. The screen below will appear. Before you play the geotracker event, you will change the speed units from hours to minutes so that you are able to view the walking traverse. After you have changed the Playback units to minutes hit OK, then hit the play button in the Playback Manager.
7. The play button will begin the traverse with the first point entered. This was also the time at which data collection started. The following two screen captures show the progression of the geo-tracker through the Terrace View traverse as your crew picked up all the needed point information.
Step 6 - Adding background mapping. To enhance your map, you can add a digital raster graphic (DRG), available as a download from several public sources. For this project, you add the local USGS topographic quad sheet previously downloaded from the internet. After downloading the graphic image, called a TIFF, you will add it as a theme using the following procedure. First, press the Add Theme button.

[Note on projection conformity: Recall that when the data files were exported as shape files in Pathfinder Office, the coordinates were set to UTM, Zone 17N, NAD27. This coordinate system was chosen to match the USGS topographic graphic to be used for background mapping. Subsequently, when the TIFF image is added to the drawing, it should be placed in correct position with the traversed points accurately shown in proper coordinate position.]

When the Add Theme dialog box comes up, you must change the data source type to Image Data Source, using the scroll-down menu. Next, browse to the location of the downloaded graphic image (note the .tif extension). Hit OK, then drag the new theme (37080b4.tif) to the bottom of the legend and turn on the theme by clicking on it. You will probably want to go back into the legend editor and resize the point symbology to make it a more readable map. In the screen capture below, the DRG image is shown along with new symbology and sizing for the features.
Step 7. Making the final map. All good projects must come to an end, and this project is no exception. You have walked the traverse, gathered points, corrected data, converted the corrected point data to an exportable file format, successfully displayed the data, and now have the pleasure of presenting your data to the world. The use of ArcView for presentation is as much an art as a science, therefore, you will not be expected to produce a National Geographic-grade quality map your first try. This tutorial will stop here and leave you with an example map to give you some idea of what a finished map for your project might look like. It is up to you to take the next step into ArcView to learn how to make these maps happen. Good luck and enjoy the adventure!
Section 7.3 – Working with AutoCAD

Overview:
The following steps will guide you through the process of presenting your data in AutoCAD. Please refer back to Section 6 for information on exporting data for use in AutoCAD.

Step 1 – Starting AutoCAD and CAD Overlay. CAD Overlay is always used to GEO-reference TIFFs within AutoCAD.

1. Select File from the pull-down menu and open the dxf file exported in Section 6.
2. At the command line, you should type zoom (enter) and extents (enter). This will zoom to the area that was surveyed.

Step 2 – Inserting the DRG. Now you will insert the DRG (digital raster graphic), which was download in the introduction.

1. Select Image/Insert from the pull-down menu.

2. Select the TIF image and click Open.
3. Be sure that the Correlation Source is World File and click Next.
4. For the Modify Correlation Values dialog box, accept the defaults by clicking Next.
5. For the Insertion dialog box, accept the defaults by clicking Next.
6. Click Finish. WOW! You now have the DRG in AutoCAD.
7. At the command line, you should type `zoom` (enter) and `extents` (enter). This will zoom out to include the entire DRG.
8. Select the edge of the DRG so that the grips appear.
9. Go to the pull-down menu `TOOLS/Display Order`

```
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<th>Tools</th>
<th>Draw</th>
<th>Dimension</th>
<th>Modify</th>
<th>Window</th>
<th>Image</th>
<th>Map</th>
<th>Help</th>
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<td>Point A</td>
<td>Meet</td>
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<td>Center</td>
<td>Ctrl+2</td>
<td>Send</td>
<td>To</td>
<td>Back</td>
</tr>
</tbody>
</table>
```

10. Select `Send to Back`. This will move the DRG behind the survey points.
11. Use the zoom window command and zoom to your survey area.
12. If the points are too large or too small, you may change the size by going to the `Format` pull-down menu and selecting `Point Style`.
13. For `Point Size`, enter 20 and select `absolute`. 
14. You may now create a layout in AutoCAD for plotting of your final product. The following figure is only an example. The drawing is not printed to standard engineering scale.
Appendix